WE CLAIM

1. A method for adaptive channel estimation comprising:

providing a channel estimate;

determining an at least one channel condition; and

determining an adapted channel estimate as a function of the channel estimate and the channel condition.

2. The method of claim 1 wherein the channel estimate is a function of the equation $\mathbf{G}_{u,m} = \mathbf{X}_u^H \mathbf{Y}_m$ and $\mathbf{z}_u(t,f) = \begin{bmatrix} e^{-j(0t-0f)} \\ \vdots \\ e^{-j((K-1)t-0f)} \\ e^{-j(0t-f)} \\ \vdots \\ e^{-j((K-1)t-(B-1)f)} \end{bmatrix}$.

3. The method of claim 1 wherein the channel estimate is a function of the equation $\mathbf{H}_n(k) = \mathbf{Y}(k)/p_1(k)$.

4. The method of claim 1 wherein the channel condition is selected from the group comprising multi-path component, direction of arrival, dominant time-taps, time of arrival, and Doppler frequencies.

5. The method of claim 1 wherein the adapted channel estimate is a function of the equation:

$$\min_{t_\ell, f_\ell, P_u, \gamma_{m,u}} \sum_{m=1}^{M} \left| \mathbf{Y}_m - \sum_{u=1}^{U} \mathbf{X}_u \mathbf{F}_u \gamma_{m,u} \right|^2 + \alpha \sum_{m=1}^{M} \sum_{u=1}^{U} \gamma_{m,u}^H \gamma_{m,u} .$$

6. The method of claim 1 wherein the channel condition includes a time separation value.

7. The method of claim 1 wherein the adapted channel estimate is a function of the equation:

$$p_n(k) = p_1(k)e^{-j2\pi k(n-1)L_s/K}.$$

8. The method of claim 1 wherein the channel condition includes a TOA estimate.

9. The method of claim 1 wherein the adapted channel estimate is a function of the equation:

$$\nabla t_\ell = \sum_{k=0}^{K-1} \mathrm{Im}\left\{ke^{jkt_\ell}\boldsymbol{\gamma}_\ell^H \mathbf{H}_n(k)\right\} - \sum_{k=0}^{K-1} \mathrm{Im}\left\{\sum_{\substack{p=1 \\ p\neq\ell}}^{P} \boldsymbol{\gamma}_\ell^H \boldsymbol{\gamma}_p k e^{-jk(t_p - t_\ell)}\right\}.$$

10. The method of claim 1 wherein the channel condition includes a time domain channel estimate.

11. The method of claim 1 wherein the adapted channel estimate is a function of the equation:

$$\boldsymbol{\sigma}_h = \sigma_n \mathbf{Q}\mathbf{d}.$$

12. The method of claim 1 further comprising: replacing the channel estimate with the adapted channel estimate.

13. The method of claim 1 further comprising:

initializing at least one iteration variable;

calculating an error update as a function of the iteration variable; and

determining the adapted channel estimate as a function of the error update.

14. The method of claim 1 further comprising:

estimating a plurality of TOA values;

separating the TOA values as a function of a time separation value; and

determining the adapted channel estimate as a function of the separated TOA values.

15. The method of claim 1 further comprising:

estimating a plurality of TOA values;

calculating a TOA gradient as a function of the TOA values; and

determining the adapted channel estimate as a function of the calculated TOA gradient.

16. The method of claim 1 further comprising:

providing a threshold value;

determining a dominant tap value as a function of the threshold value; and

determining the adapted channel estimate as a function of the dominant tap value.

17. A system for adaptive channel estimation comprising:

means for providing a channel estimate;

means for determining an at least one channel condition; and

means for determining an adapted channel estimate as a function of the channel estimate and the channel condition.

18. The system of claim 17 further comprising means for replacing the channel estimate with the adapted channel estimate.

19. The system of claim 17 further comprising:

means for initializing at least one iteration variable;

means for calculating an error update as a function of the iteration variable; and

means for determining the adapted channel estimate as a function of the error update.

20. The system of claim 17 further comprising:

means for estimating a plurality of TOA values;

means for separating the TOA values as a function of a time separation value; and

means for determining the adapted channel estimate as a function of the separated TOA values.

21. The system of claim 17 further comprising:

means for estimating a plurality of TOA values;

means for calculating a TOA gradient as a function of the TOA values; and

means for determining the adapted channel estimate as a function of the calculated TOA gradient.

22. The system of claim 17 further comprising:

means for providing a threshold value;

means for determining a dominant tap value as a function of the threshold value; and

means for determining the adapted channel estimate as a function of the dominant tap value.

23. A computer readable medium storing a computer program comprising:

computer readable code for providing a channel estimate;

computer readable code for determining an at least one channel condition; and

computer readable code for determining an adapted channel estimate as a function of the channel estimate and the channel condition.

24. The computer readable medium of claim 23 further comprising computer readable code for replacing the channel estimate with the adapted channel estimate.

25. The computer readable medium of claim 23 further comprising:

computer readable code for initializing at least one iteration variable;

computer readable code for calculating an error update as a function of the iteration variable; and

computer readable code for determining the adapted channel estimate as a function of the error update.

26. The computer readable medium of claim 23 further comprising:

computer readable code for estimating a plurality of TOA values;

computer readable code for separating the TOA values as a function of a time separation value; and

computer readable code for determining the adapted channel estimate as a function of the separated TOA values.

27. The computer readable medium of claim 23 further comprising:

computer readable code for estimating a plurality of TOA values;

computer readable code for calculating a TOA gradient as a function of the TOA values; and

computer readable code for determining the adapted channel estimate as a function of the calculated TOA gradient.

28. The computer readable medium of claim 23 further comprising:

computer readable code for providing a threshold value;

computer readable code for determining a dominant tap value as a function of the threshold value; and

computer readable code for determining the adapted channel estimate as a function of the dominant tap value.